of actual rates paid. Thus, effective tax rates may be regarded as the incentive structure enacted by the Congress. 3/

In 1985, effective corporate tax rates varied mainly between 15 percent and 25 percent, although in a few industries they were higher or lower (see Table 5). The primary metals industry, of which the steel industry is part, had an effective rate of 23 percent. 4/ Assuming that the tax rate of the steel industry was the same as that of primary metals, the industry had an effective tax rate slightly higher than the mean, but not significantly so. While several nonmanufacturing industries were below average, 19 of the 26 industry groups reported had effective tax rates higher than 20 percent. Thus, the rates in Table 1 suggest that the taxes on steel were well within the central trend, and provided no significant incentives or disincentives to steel investment.

Although steel capacity benefited from generous capital consumption or depreciation allowances under the old tax law, these were of little value as steel firms became unprofitable and hence paid no taxes. The inability of steel firms to use their depreciation allowances shows that these rates should be considered as hypothetical. It also shows that the tax system is difficult to use as a mechanism to provide economic incentives since the particular circumstances of the individual taxpayer can easily block the intent of the framers.

STEEL AND THE NEW TAX LAW

The Tax Reform Act of 1986 offers significant benefits to the steel industry, mainly through its transition rules for unused investment tax credits but also by allowing the steel companies to carry forward their net operating losses.

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3. Among other things, these effective tax rates assume that every firm is profitable enough to make use of all its allowable depreciation allowances and that its pattern of investment by asset matches that of the industry as a whole. Estimates are also sensitive to assumptions about inflation and inflation-adjusted interest rates. Consequently, effective tax rates should be used for general comparisons and not to make fine distinctions. For a discussion of effective tax rates, see Congressional Budget Office, *Federal Financial Support for High-Technology Industries* (June 1985), Appendix B and references therein. See also Congressional Budget Office, *Revising the Corporate Income Tax* (May 1985).

4. Congressional Budget Office, *Revising the Corporate Income Tax* (May 1985), pp. 72-75.

TABLE 5. EFFECTIVE TAX RATES ON PLANT AND EQUIPMENT, SELECTED INDUSTRIES, 1985 (In percent)

Category	Effective Tax Rate
Manufacturing	
Petroleum and coal products	32
Furniture and fixtures	28
Transportation equipment, except motor vehicles and ordnance	28
Leather and leather products	27
Printing, publishing, and allied industries	26
Food and kindred products	24
Tobacco manufactures	24
Fabricated metal industries	24
Instruments	23
Primary metal industries (steel)	**23**
Apparel and other fabricated textile products	22
Stone, clay, and glass products	22
Machinery except electrical	21
Electrical machinery, equipment, and supplies	21
Textile mill products	21
Lumber and wood products, except furniture	20
Chemicals and allied products	18
Rubber and miscellaneous plastic products	18
Motor vehicles and motor vehicle equipment	16
Paper and allied products	14
Wholesale and Retail Trade	25
Public Utilities	21
Services	20
Construction	16
Transportation	14
Communication	9

SOURCE: Congressional Budget Office, *Revising the Corporate Income Tax* (May 1985), Table 8.

NOTE: Tax rates are computed under the assumptions of 100 percent equity financing, a 6 percent expected inflation rate, and a real rate of return of 4 percent net of the corporate taxes. The taxpayer is a corporation with a statutory marginal tax rate of 46 percent. Taxes paid by individual shareholders on dividends and capital gains are not counted in the calculation; the tax rate is the corporate-level tax only.

The Transition Rules

The new tax law provides a special transition rule to enable steel companies and farmers to benefit from unused investment tax credits (ITCs) by deducting them from income taxes owed. Because steel companies have been unprofitable and hence have not had tax liabilities, most large integrated companies have not been able to use all the ITCs to which they were entitled under the previous law. Consequently, the Congress included a transition rule permitting them to use their unused ITCs regardless of their current or future profitability.

The rule specifies that qualified companies will be entitled to carry their unused ITCs back to previous tax years and apply them against taxes paid in those years. Unlike the previous law, which provided a three-year carryback period, the transition rule has a 15-year carryback provision. For example, a steel company that has been unprofitable (and unable to use its ITCs) since 1980, can carry its unused ITCs as far back as 1966 (15 years before 1980), cashing them in against taxes paid during that period. 5/ Thus, starting in the first quarter of 1988, at the close of the tax year 1987--the first year covered by the transition rule--the federal government may be writing checks for refunds on ITCs for many major steel companies. Companies in other industries, by contrast, will be allowed to carry their unused ITCs back only three years, and must discount them by 35 percent in 1988.

The amount of unused ITCs held by qualified steel-producing companies totals almost $1.3 billion, but 10 percent to 20 percent are related to nonsteel activities. The Congress also placed several limitations on this transition rule, which could limit the Treasury's exposure to about $500 million. First, unused ITCs carried back are discounted by 50 percent. Second, only a handful of companies are eligible. 6/ Third, the ITCs cannot be carried back before 1962, the year they were introduced. Finally, the refunds must be used in the steel industry for reinvestment and modernization, R&D, retraining of workers, working capital for steel operations, and

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5. Of course, there will be no new ITCs at all for any firm as of December 31, 1986, other than credits for rehabilitating old or historical buildings.

6. Companies must--with one exception--have produced at least 1,500,000 net tons of steel in 1983. Companies included in CBO's analysis are Armco Incorporated, Bethlehem Steel, Inland Steel, LTV Corporation, National Intergroup, U.S. Steel, and Wheeling-Pittsburgh Steel.

other appropriate projects. In the case of LTV, which is in bankruptcy, the refunds will be used in steel production or for employee benefits, rather than for paying off creditors.

Although the transition rules require reinvestment in steel, such investment is unlikely to increase by the amount of the refund since the firms cannot be expected to undertake substantial expansion under foreseeable circumstances.[7] The refund will probably be used largely to replace currently planned expenditures.

According to the CBO steel model, the effect of this refund on the steel industry will be small. Even so, the model seems to overstate the reaction of the industry to the refund. In the model, increased after-tax profits in one period encourage new investment in subsequent periods. But the ITC refund will boost profits in 1988 without adding to the profitability of subsequent investment, and hence it will provide no incentive to reinvestment in steel. According to the model, the effect should be to increase domestic capacity slightly, but to reduce steel employment in subsequent years (see Appendix B). For purposes of simulation, CBO assumed that the transition rule boosts after-tax profits by $500 million in the first quarter of 1988. Under the model, steel companies use part of this money to buy electric arc furnaces, which require less labor than current furnaces, causing the labor force to decrease by a small amount. Productivity rises somewhat, and imports fall by a minuscule amount.

Permanent Features of the Tax Law

After the transition, the new law will affect steel investment in two ways: in the treatment of net operating losses, and in the depreciation of capital equipment.

Net Operating Losses. In recent years, the steel companies have accumulated roughly $7 billion worth of net operating losses (NOLs).[8] These can be carried forward as an offset against future profits on which the companies would otherwise have to pay taxes. A company's use of NOLs is

7. Being in bankruptcy, LTV for one is not likely to expand its capacity.

8. In the fall of 1986, the major steel companies had accumulated over $7 billion worth of NOLs. Salomon Brothers, "The Domestic Steel Industry--Of Taxes and Acquisitions" (October 15, 1986).

not restricted to the lines of business in which the NOLs were incurred; it can use them to offset income earned in other industries. This accumulation of NOLs ensures that, by and large, steel companies will not be paying taxes for several years once they return to profitability.

The new bill makes several changes in the treatment of NOLs. Most important, it seeks to ensure that firms with NOLs do not become candidates for takeover merely because of them: if 50 percent or more of a firm's ownership changes, the percent of outstanding NOLs that can be used in any one year will be substantially reduced, and their use will be disallowed entirely if, in the two years following any ownership change, a company changes its line of business. 9/

The value of the NOLs has been reduced by the new law, however. The fall in the top marginal tax rate from 46 percent to 34 percent lowers the tax liability that can be offset with each dollar of NOL. Also, NOLs can no longer be used to offset completely the minimum tax.

The new tax law will further encourage steel companies to diversify outside the industry. They will be at an advantage in bidding for new business against firms without a substantial level of NOL carryforwards, simply because they can shelter from taxes most of the profits associated with the new business. Moreover, the lack of substantial profits in most of the steel industry encourages companies to invest outside the industry so as to use their NOLs--for example, by buying existing firms with positive and sizable income streams. NOLs enable steel companies to make investments that pay a before-tax rate of return below market rates but yield after-tax returns equal to market rates. In short, the NOLs act as a subsidy for steel company investments in takeovers.

Steel companies, however, face a problem in this respect. They cannot make such investment in small increments; companies must be bought in large discrete amounts. 10/ Because the structure of capital in the steel industry is already skewed heavily toward debt, which might otherwise be used in finance takeovers, a steel company would have to accumulate investment funds and await the opportunity to make a sizable purchase. Thus,

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9. U.S. Congress, Conference Report on H.R. 3838, Tax Reform Act of 1986, Managers' Report, Title VI, Subtitle H.

10. While some profitable companies available for takeover are small, the transaction costs of takeovers and limited management time would seem to favor large takeovers.

capital constraints, combined with the expectation of unprofitable returns from large investments in steel, may combine to discourage even incremental investments in steel, because scarce investment funds will find the highest return if used to diversify elsewhere.

The new tax law undertook to reform the tax structure by eliminating most tax preferences, notably that for capital gains, and by reducing the passthrough of passive losses in limited partnerships. These two provisions of the law had been widely used to design tax shelters in industries such as real estate, oil and gas, and timber. Steel companies will no longer be bidding against tax shelters in these areas.

A negative aspect of the new law's treatment of NOLs is that it could encourage poorly run firms to take over well-run firms. As noted above, if outsiders take over a company having NOLs, their use of them will be limited under the new law while no such limits are placed on the use of NOLs by the management that incurred them. To the extent that losses reflect on the quality of management, the NOL restrictions may spur bad management to buy out good management.

Effective Tax Rates and Future Steel Investment. In its capital depreciation system, the new tax law treats investment much more neutrally than did the old law, which tilted toward certain investments and activities. 11/ If the new capital cost recovery system does not favor the steel industry, neither does it favor industries that are competing with steel. Investment patterns will be determined by the market rather than by the Congress.

For instance, under the old law the aircraft manufacturing industry had an effective tax rate less than one-half the manufacturing average. 12/ Under the new law, the two have the same rate. The effective tax rate in steel is 31 percent, almost the same as the manufacturing average, which is 32 percent. (Under the old law, the steel rate was 23 percent and the manufacturing average 22 percent.) The net effect of the bill has thus been to narrow the range of corporate rates, but it has done so by raising many of them. From the perspective of the steel industry, the question is whether the narrowing of the gap between steel and other investments is worth the higher absolute level.

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11. This discussion does not deal with the question of the law's asymmetrical treatment of profitable and unprofitable firms.

12. Congressional Budget Office, *Federal Financial Support for High-Technology Industries* (June 1985), p. 46.

CONCLUSIONS

In the main, the tax law will only reinforce negative signals provided by the industry's chronic overcapacity and lack of profits. Were there opportunities for substantial profitable investment in steel, the same tax advantages that are driving the companies out of steel would induce them to invest in their own industry. Tax reform will provide a substantial amount of capital to the industry through the ITC refund and the restrictions on outsiders' use of NOLs. Moreover, these advantages are accruing to steel at the same time that other industries are losing theirs. Viewed only from the tax perspective, steel firms are thus in a good position to make capital investments, though not in steel.

Under the previous law, many investments were favored in a way that steel investment was not. The new law ends preferential treatment for long-term capital gains and places limits on the use of NOLs derived from passive sources to offset other income. Consequently, steel investment will less often have to compete in capital markets against tax-preferred industries, but steel investment will continue to suffer even under tax reform.

CHAPTER III

FEDERAL FUNDING OF STEEL RESEARCH

Federal government agencies currently fund about $26 million a year in research that could aid innovation in the steel industry.[1] As shown in Table 6, the Department of Energy spends approximately $6.9 million on research into energy-saving steel processing techniques. The National Science Foundation spends about $8 million on basic research into manufacturing processes and the uses of steel. The Department of Interior's $5 million funding focuses on the conservation and reuse of scarce inputs into steelmaking. The National Bureau of Standards spends $1.9 million on research into the effects of various aspects of steelmaking on quality control; it is also developing sensors that will help steel manufacturers produce high-quality steels. The Department of Defense spends $4.5 million on developing better and/or less expensive steels for the special needs of military construction.

In addition to direct spending, the federal government also gave the steel industry $2.1 million in research and development tax credits in 1983.

The industry itself spends roughly $400 million on its research programs. This amount is equal to 0.6 percent of sales, as compared with about 2.6 percent for the average manufacturing industry. The federal research spending mentioned above equals another 0.04 percent of sales, while the federal research effort for all manufacturing is 1.2 percent of sales.

DIRECT FEDERAL FUNDING

This section describes the research that is funded directly by federal government agencies.

1. Because the research has a broad focus, many agencies cannot determine a precise dollar amount for what they spend on steel research. The figures used here are based on the best guess of the contracting agency.

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TABLE 6. FEDERAL FUNDING OF STEEL-RELATED RESEARCH

Agency/Program	Description	Amount (millions of dollars)
Department of Energy		
Office of Industrial Programs		
U.S. Steel-Bethlehem Steel	Thin-slab continuous casting	30 over five years
Westinghouse Electric-Armco	Thin-strip continuous casting	2 over three years
Sensors Development		1 over four years
Office of Fossil Energy		
Weirton Steel	Clean Coal Technology Program	In negotiation
National Science Foundation		
Miscellaneous grant programs		1.1 to 1.4
Materials Research Labs		
M.I.T.	High-technology steels	1.12
University of Pennsylvania	Micromechanics of interfaces	1
Northwestern University	Corrosion	0.2
Harvard University	Micromechanics of materials	0.3 to 0.35
Brown University	Large strain deformation and fracture of materials	1
Industry-University Cooperative Research Centers		
Colorado School of Mines	Steel processing	0.1 to 0.125
Carnegie-Mellon University	Steel making	0.1 to 0.125
Engineering Research Centers		
Lehigh University	Large scale structural systems	1.4
Ohio State University	Net final shape manufacturing	1.25
Department of the Interior		
Office of Minerals and Materials Research		5
National Bureau of Standards		1.9
Department of the Navy		
David W. Taylor Naval Ship Center		
High strength-low alloy steels development		1.8
Modification of commercial steels		0.45
Title III of the Defense Production Act		Up to 120
Office of Naval Research	Welding	1
Naval Research Lab	Advanced ferrous alloys	0.4
Naval Sea Systems Command	Types of control in HSLA steels	0.35
Department of the Army		
Army Materials Technical Lab	Better steel performance in armor	0.47

SOURCE: Congressional Budget Office.

NOTE: These figures are agency estimates of fiscal year 1986 expenditures except for Title III of the Defense Production Act, which is still under development. In this case, the agency's estimate of total expenditures is given.

Department of Energy

The Department of Energy (DOE) funds research into processes that will lessen energy consumption in steel production. The most promising methods are those aiming at a more continuous steelmaking process. DOE is planning to pursue one such method in conjunction with a program to promote the "clean" use of coal.

Traditionally, steelmaking has consisted of four stages: preparation of the raw inputs of iron ore and coal; production of steel; production of semifinished steel shapes; and production of finished products. Much of the recent progress in eliminating steps (thus lowering costs and reducing the use of energy) has occurred in the production of semifinished steel shapes. In the past, steelmakers formed semifinished shapes by allowing molten steel to harden into ingots, which later would be reheated and rolled. Increasingly, manufacturers have turned to continuous casting, in which molten steel is formed directly into semifinished shapes without cooling into ingots.

DOE is funding two major projects in continuous casting technology. One, with U.S. Steel and Bethlehem Steel, is a five-year effort to bring on line a pilot plant that would cast steel from a molten state to one-inch-thick slabs. DOE has obligated $16 million over the first three years of this project. It anticipates spending a total of $30 million.

The second is a project with Westinghouse Electric and Armco to develop a wheel casting process that would produce steel strips three inches wide and half an inch thick. DOE expects to spend $2 million on this project over three years.

DOE is also working, in coordination with the National Bureau of Standards, on the development of sensors to measure internal temperature distributions in hot steel slabs, which could lead to improvements in productivity and energy efficiency. DOE has spent $1 million on sensor development over the last four years.

The Congress also has charged the Department of Energy with oversight of the Clean Coal Technology program, designed to demonstrate commercial feasibility of industrial coal technologies that conform with emission levels set by the Clean Air Act. DOE has solicited bids under the program and currently is negotiating contracts. One of the winning bidders is Weirton Steel, which has proposed construction of a demonstration plant to reduce iron ore directly. Direct-reduction techniques replace blast fur-

naces and coke ovens with less capital-intensive processes. Oil- and gas-based reduction techniques are already in commercial use in areas where fuel prices are low. Coal-based reduction, an even less expensive process, could be more widely competitive. While the contract is still under negotiation, industry sources suggest that it will be in the range of $180 million. DOE will pay 35 percent of the cost.

National Science Foundation

The National Science Foundation (NSF) funds basic research, although often with an eye toward future applications. NSF spends $3 million to $4 million on steel-related research. Of that, $1.1 million to $1.4 million is used to fund directly about 80 small grants. The rest is spent on three types of cooperative research centers, many of which also have industry funding.

One type of center that NSF funds is the Materials Research Lab type (MRL), devoted to multidisciplinary research. MRLs at five universities have steel as one of their major research (or "thrust") areas: the Massachusetts Institute of Technology (high-technology steels); the University of Pennsylvania (micromechanics of interfaces on steels and iron-based alloys); Northwestern University (corrosion); Harvard University (a related project on how the nature of materials affects their mechanical behavior); and Brown University (large-strain deformation and fracture of metals).

NSF also gives seed money for the start-up of industry-university cooperative research centers that will focus on science and engineering topics relevant to industry. Two centers that are still in their five-year start-up phase and are therefore receiving NSF money are engaged in steel research: at the Colorado School of Mines (steel processing) and at Carnegie-Mellon University (steelmaking). NSF's funding of each of these centers (at a total of $200,000 to $250,000) is in its third year.

Two years ago, NSF began funding engineering research centers to enhance the international competitiveness of U.S. industry. Funding is not guaranteed for any specific period, but will be evaluated three years into the funding cycle. The engineering research center at Lehigh University (which receives $1.4 million from NSF) looks at new techniques for building large-scale structural systems (buildings, bridges). (Of this, the research most relevant to the steel industry is into lessening corrosion.) The engineering research center at Ohio State University (which receives $1.25 mil-

lion from NSF) investigates getting steel and other metals as close to final shape as possible during the initial manufacturing processes.

Department of the Interior

The mission of the Bureau of Mines (BOM) is to achieve a more efficient use of strategic materials. Some strategic materials are inputs into steel; others are used in steel processing and then discarded; still others are found in steel scrap. While BOM's research clearly is not intended to aid innovation in the steel industry directly, some of its projects could develop processes that would have such an effect. For example, its research into methods of recycling strategic materials presently lost in steelmaking might aid in developing new, less expensive methods of steel processing. An ability to recycle strategic minerals from steel slag would also lower the costs of steel production by creating usable byproducts.

BOM spends $5 million a year on research that could potentially aid the steel industry. Some of the projects it funds include: enhancing the properties of iron ore pellets used as input into the steelmaking process; exploring trends in the quality of iron scrap, which is used in minimills; improving the efficiency of the pickling baths used to clean processed steel, and recovering more of the nickel and chromium currently discarded from used bath solutions; and improving energy efficiency in electric furnace steelmaking.

National Bureau of Standards

The National Bureau of Standards (NBS) provides industry with broad-based support in measurement technology and standardization. NBS has a metals research program, many aspects of which encompass steel, but until recently it did not have a separate steel research program. In January 1986, as part of the Keyworth steel initiative, the Congress appropriated $1.9 million for NBS steel research. NBS expects to get almost as much in fiscal year 1987. The purpose is to develop the technology for measuring and maintaining high quality control in steel production. About half of the steel initiative money is being spent on the development of sensors to be used as solidification process controls. Other research areas include: measuring the size and shape of imperfections in finished steel; modeling the solidification process for continuous casting; and bioprocessing scrap and ore (already being done in copper processing).

Department of Defense

The goal of the steel research programs in the Department of Defense (DoD) is to develop better and/or less expensive steels for naval construction and, to a lesser extent, for armor. The benefits to the steel industry depend on the extent to which improved practices and new steels developed by DoD are applicable to commercial uses.

The David Taylor Naval Ship Research and Development Center funds most of the steel research conducted by DoD. The Center is spending $1.8 million this year on its ongoing development of a new high-strength/low-alloy steel (HSLA) that will be less expensive to weld than the steels now used in naval construction, but without any loss of properties. In the beginning, HSLA steels would be used only in those applications where the high strength of naval steel is not needed, but they might eventually replace standard high-strength steels. The Center is also spending $450,000 in basic research on modifying commercial steels that are currently almost good enough for naval use. The research covers high-strength steels and lower-strength steels that the industry is in the process of developing for commercial uses.

The Defense Department hopes to implement Title III of the Defense Production Act beginning in fiscal year 1988. Under Title III, DoD would subsidize an American steel producer's upgrading of a mill to make it capable of producing HSLA steels; DoD would commit itself to purchasing its next five year's HSLA steel requirements from that mill. The goal is to reduce the high cost of alloys used by DoD, and to reduce the need for imported chromium, recognizing that limited commercial markets exist for HSLA steels and that a manufacturer would take a large financial risk in upgrading without the guarantee of a market. In Phase I of Title III, DoD will certify steels for use in military construction. In Phase II (beginning in fiscal year 1990), it will bring a plant on line. DoD expects to spend $20 million on the plant upgrade and $90 million on the subsequent steel purchases.

The Defense Department is funding a number of other steel-related research projects. These include research into welding sciences, fluxes, and model arc welding, in the hope of reducing welding costs; research into advanced ferrous alloys and the modeling of alternative low-carbon advanced ferrous alloys; research into the complementary subject of types of control in HSLA steels; and research into materials modification and new armor applications of certain types of steel that have not been tried previously. DoD is spending $2.2 million on these projects.

RESEARCH AND DEVELOPMENT TAX CREDIT

Because the steel industry performs very little research on its own, the incremental research and development tax credit does not provide much R&D support for the steel industry. In 1983, the most recent year for which data exist, the industry applied for $2.1 million worth of credit.[2] The smallness of the tax credit can best be explained by examining corporate R&D spending. In 1984, the steel industry spent $390 million on R&D, an amount equal to 0.6 percent of sales, while the average manufacturing industry spent 2.6 percent of sales on R&D. Moreover, steel R&D spending has been essentially flat since 1981, while aggregate corporate R&D has risen by over a third.[3] A lack of taxable profits may also help explain the low level of R&D in steel.

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2. The data are based on preliminary returns. See *Internal Revenue Service Source Book 1983*, Statistics of Income, Corporation Tax Returns, p. 89.

3. National Science Foundation, *Research and Development in Industry* (1984). For a detailed discussion of the R&D credit, see Congressional Budget Office, *Federal Financial Support for High-Technology Industries* (July 1985).

CHAPTER IV

IMPORT RESTRAINTS, MERGERS, AND PLANT CLOSINGS

The federal government has intervened from time to time to help the steel industry reduce its costs and increase its international competitiveness. Chapters II and III discussed efforts to spur modernization by means of tax incentives and R&D grants. On at least three occasions Washington has also imposed restraints on imports, without much success. Other ways in which the government has affected or could affect the industry include relaxing the restrictions on mergers and acquisitions or absorbing some of the costs of eliminating excess capacity. This chapter considers these three approaches to increased competitiveness.

IMPORT RESTRAINTS

Perhaps the most visible manifestation of the steel industry's decline is rising imports. Trade restraints are seen as a means of increasing domestic production and profitability, thus providing the industry with the resources to invest in more efficient facilities.

The government has initiated major protective measures on three separate occasions. During the late 1960s, it negotiated voluntary restraint agreements with Japan and the European Economic Community. In the late 1970s, it established a trigger price mechanism to discourage foreign steelmakers from dumping their products on the U.S. market at less than their own costs. Finally, in 1984, President Reagan ordered the negotiation of voluntary restraint agreements with major exporters after the U.S. International Trade Commission found that the domestic industry had been injured by imports.

The First Two Episodes of Major Protection

A sharp rise in steel imports during the 1960s, at a time of stagnant growth in domestic production, led to calls for trade protection. Both Japan and the European Economic Community agreed to limit their exports of steel

products to the United States for three years beginning in 1969. The agreements were extended for another three years after they expired. 1/

The agreements had, however, little real effect on the steel industry. A recession slowed domestic consumption in 1970, creating a smaller market for domestic producers, despite the restraints. In 1973 and 1974, during a worldwide steel boom, domestic steel prices were controlled. Imported steel prices rose rapidly, and demand for domestic steel surged. Moreover, imports from unconstrained sources grew during the period of controls. As a result of those factors, the limits on steel imports did not increase demand for domestic steel by much and for most of the period industry profits were lower than they had been. According to the CBO steel model, the voluntary restraint agreements did not significantly affect the quantity of imports, and consequently they did not increase domestic prices and output. Moreover, through much of the period that the restraints were in effect (1969-1974), investment in the industry declined.

In response to a new surge of steel imports, the United States instituted the trigger price mechanism in 1977. Domestic steel producers maintained that foreign producers were dumping steel in the United States--that is, selling it below their own costs. To dissuade them, the United States established trigger prices; foreign producers selling steel below the costs of efficient Japanese producers were subject to accelerated antidumping proceedings: those found guilty of dumping would be subject to countervailing duties. Like the voluntary restraint agreement, however, this episode of protection did not lead to a substantial improvement in the industry's output, profitability, or investment. For example, the CBO steel model indicates that the trigger price mechanism did not have a significant effect on the price of imports or demand for domestically produced steel. Basing the trigger prices on the costs of efficient Japanese producers essentially gave less efficient firms in other countries a license to dump.

The Current Round of Protection

In September 1984, President Reagan instructed the United States Trade Representative to negotiate voluntary export restraint agreements with countries that are the principal exporters of steel to the United States. The

1. For a more detailed discussion of the effects of the voluntary restraint agreements and the trigger price mechanism, see Congressional Budget Office, *Has Trade Protection Revitalized Domestic Industries?* (November 1986), pp. 39-58.

goal was to reduce steel imports from nearly 27 percent of U.S. steel consumption in 1984 to 20.2 percent. 2/ Imports subsequently fell to roughly 25 percent of U.S. consumption in 1985 and to a little over 23 percent in the 12 months ending October 1986. Even without the restraint agreements, import penetration would probably have fallen because of the declining value of the dollar. In any event, the 20 percent target proved unattainable; apparently the goal now is to limit imports to about 23 percent. The lower target has been difficult to reach, in part because of the rapid growth of imports from producers not subject to the restraints.

Since the current restraint program is only in its second year, its effects cannot be fully judged. The industry continues to lose money, however, and two integrated producers--Wheeling-Pittsburgh and LTV--have declared bankruptcy. Moreover, the International Trade Commission reports that in the 12 months ending June 1986, capital expenditures in the industry declined by 25 percent. 3/

Simulations with the CBO steel model indicate that the current trade restraints may not substantially improve the industry's competitiveness. If the restraints were to achieve the revised goal of limiting import share to 23 percent through 1989, total investment during the period would be less than 1 percent higher than it would have been without the quotas. Appendix B contains estimates from the model. Even without the restraints, the model finds that the share of imports may be less than 23 percent in 1987 and 1988 because of the declines in the value of the dollar. Thus, over the life of the program, the restraints would lift industry shipments by less than one-half of 1 percent. In 1990, the year after the quotas lapse, both domestic shipments and imports would be at the same levels as if there had been no quotas.

To gain further insights into the ability of quotas to revitalize an industry, CBO considered the effects of limiting import share to 20 percent through 1992. Essentially, this means assuming that the President's program achieved its original goals and was extended for three more years. The CBO steel model projects that total capital expenditures during the eight years would be 7 percent higher than without the quotas. During this period, total

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2. See David J. Cantor, "The President's Steel Import Program: One Year Later," Congressional Research Service, processed, October 16, 1985.

3. See U.S. International Trade Commission, *Annual Survey Concerning Competitive Conditions in the Steel Industry and Industry Efforts to Adjust and Modernize* (Washington, D.C.: USITC, September 1986).

domestic shipments would increase by 7.4 percent, and employment would be correspondingly larger as well. Because of the greater operating rates and the increased investment, the average cost of producing steel would decline by 3.3 percent. These limited gains would be costly, however. The combined average price of domestic and imported steel in 1992 would be 4.4 percent higher.[4] The gains would also be short-lived. Because of the limited increase in investment, the competitive position of the domestic industry would probably not be substantially improved once the quotas were removed.

Trade policy has not, therefore, had as pronounced an effect on the domestic steel industry as is commonly supposed. The primary reason why protective programs fail is that they do little to increase the profitability of cost-reducing investments. If new plant and equipment could reduce the average cost of making steel by 10 percent, it would do so whether or not the industry was protected.[5] Neither can protection be expected to produce new technologies that overcome the sources of the industry's cost disadvantage. Moreover, by limiting competition, protection may reduce firms' incentives to make new and potentially risky capital expenditures.[6]

MERGERS, ACQUISITIONS, AND ANTITRUST POLICIES

Firms may be able to reduce their costs through merger and acquisition, to the extent that this enables them to make more efficient use of capacity or brings them a necessary infusion of capital or management expertise. They are limited by the antitrust laws, however, which prohibit mergers and acquisitions that are expected to raise prices significantly. Some merger proposals have been altered or abandoned for this reason, and others may have been deterred.

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4. The price of domestic steel would be up less than 1 percent. Higher prices for imported steel account for the bulk of the 4.4 percent increase.

5. In the Trade and Tariff Act of 1984, the Congress encouraged modernization by requiring steel firms, which had just been awarded protection by President Reagan, to reinvest the bulk of their cash flows in the industry.

6. For a discussion of trade protection's role in increasing the international competitiveness of steel as well as other industries, see Congressional Budget Office, *Has Trade Protection Revitalized Domestic Industries?* (November 1986).

Reducing Costs Through Mergers

Mergers and acquisitions can reduce costs in a number of ways. Consider, for example, two companies that produce similar products, both of them operating at substantially less than capacity. While both may be unprofitable, neither firm will shut down its operation so long as sales cover its out-of-pocket costs. (In fact, a firm may continue to manufacture a product that does not cover its out-of-pocket costs, if the product complements the sale of other products that are profitable, or if continued operation avoids the cost of retiring the excess capacity.) If the two firms combine operations, the new firm can trim its extra capacity but continue to sell to all the customers previously served.

Even where firms do not maintain substantial excess capacity, a merger or an acquisition may permit cost reductions. For example, if two firms sell products to the same customers, combining permits better use of sales and marketing resources. Similarly, a combination may allow firms to coordinate production among facilities; this coordination can permit cost reductions through greater specialization in multiproduct plants.

A lack of capital or management talent may limit a firm's effective use of its resources, making it an attractive takeover candidate for another firm with the necessary funds or managerial expertise. Firms outside the domestic steel industry, particularly foreign steel producers, are the most likely to make acquisitions for this reason.

Mergers, Acquisitions, and Joint Ventures

Over the last 10 years numerous domestic steel manufactures have been acquired or have merged. Most of them were relatively small companies, so there was little concern that the prices of their products would rise as a result.[7] In two cases, however, antitrust laws clearly played an important role.

In 1983, LTV announced that it would acquire Republic Steel to create the second largest steel company in the United States. The Department of Justice decided not to contest the merger, but only after LTV agreed in

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7. For a list of mergers and acquisitions involving domestic steel producers, see Mark W. Frankena and Paul A. Pautler, *Antitrust Policy for Declining Industries*, Federal Trade Commission, Bureau of Economics, Staff Report (October 1985), pp. 44-45.

1984 to divest some of Republic's facilities. An important goal of the LTV-Republic merger was to reduce costs by rationalizing capacity. This goal was apparently not met. In July 1986, two years after it had acquired Republic, LTV declared bankruptcy.

In February 1984, U.S. Steel (now USX), the nation's largest steel manufacturer, announced plans to acquire the seventh largest producer, National Steel. Opposition by the Department of Justice was one of the factors that led U.S. Steel to drop the proposal only a few months later.

Efforts of the government to protect steel against import competition have been a factor in the Department of Justice's analyses of both of these merger proposals. Restraints on imports could enable the merged producers to raise prices. The Department of Justice therefore reasoned that, because of the restraints, the merger was likely to increase domestic steel prices. To some extent, then, trade policy and antitrust enforcement appear to operate at cross-purposes. One aims at increasing competition and the other at limiting it.

Joint ventures are another form of combination. These are frequently aimed at producing a new product, like the decision of U.S. Steel and Ford's steel subsidiary to produce galvanized steel. Bethlehem and Inland also recently agreed to collaborate on the production of new steel products. 8/

A number of foreign producers have invested in the domestic steel industry. Most notably, Nippon Kokan, Japan's second largest steel company, acquired 50 percent of National Steel in April 1984. A few months earlier Nisshin, Japan's sixth largest producer, bought 10 percent of Wheeling-Pittsburgh's stock. While at the time of the transactions the domestic firms hoped that their Japanese partners would be a source of additional capital, the arrangements have apparently provided only limited benefits. 9/ Wheeling-Pittsburgh declared bankruptcy the following year, and ground has not yet been broken on a joint venture announced when Nisshin made its investment. In addition, National Intergroup, the domestic firm that owns half of National Steel, is reportedly trying to sell its

8. Department of Commerce, *1986 U.S. Industrial Outlook* (January 1986), p. 19-3.

9. "LTV Chapter 11 Filing Will Change the Way Steel Mills Compete," *Wall Street Journal*, July 18, 1986, p. 9.

share. 10/ Several Canadian producers own substantial stakes in a number of nonintegrated producers. For example, Ivaco owns a large share of both Atlantic Steel and Laclede; Costeel built Raritan River. California Steel is a joint venture of Brazilian and Japanese producers, operating the flat roll and plate facilities that formerly belonged to Kaiser Steel. It uses semi-finished steel primarily from Brazil.

Joint ventures between domestic and foreign producers include LTV and Sumitomo's production of electrogalvanized steel, and a joint venture between U.S. Steel and Korea's Pohang Iron and Steel Company to make sheet steel on the West Coast. Several other joint ventures are reportedly being considered.

Relaxing Antitrust Standards

Aside from the merger of LTV and Republic, and the proposed acquisition of National by U.S. Steel, antitrust laws do not seemed to have played much of a role in discouraging steel combinations. Nevertheless, a relaxation of antitrust standards for steel mergers might favor investment in the steel industry if the mergers were seen as leading to reduced capacity or other cost savings. In the event that a merger enabled the domestic industry to raise prices significantly, an agency like the International Trade Commission might be given the authority to relax the existing restraints on imports. It seems unlikely, however, given the industry's problems, that an easier antitrust policy would significantly lower the cost of producing steel. The recent bankruptcy of LTV reinforces this view. Any benefit from a relaxed antitrust standard would be more likely to come from permitting the industry to raise prices. From this perspective, liberalizing merger policies might further an aim of trade protection--raising prices and profitability in the domestic steel industry.

REDUCING CAPACITY

The decline in steel consumption has not only limited the incentives of steel manufacturers to invest in new plant and equipment; it has left the industry with substantial excess capacity. In the 1970s, the domestic steel industry's

10. See, for example, "Wheeling To Sell 10% To Nisshin," *New York Times*, February 8, 1984, p. D1; and "National in Japanese Steel Deal," *New York Times*, April 25, 1984, p. D1.

capacity utilization rate was well in excess of 80 percent, and as recently as 1981 it was 78 percent. After closing 13 percent of its capacity since then, the utilization rate was only 65 percent in 1985. Further reductions are apparently still needed.

A number of factors impede the rationalization of capacity. Existing labor agreements make it very expensive to lay off workers. Closing facilities may place some producers in technical bankruptcy because of covenants on outstanding loans. Finally, a number of steel companies have negotiated long-term contracts with suppliers that commit them to purchase minimum amounts of power and raw materials such as coal and ore.

Employees of integrated steel firms receive full retirement benefits if they have been employed for 30 years, and those over 60 can retire with even fewer years of service. The amount of the pension is determined by a formula combining salary, years of service, and age. For the most part, these pensions are intended to be fully funded by employer contributions made while the workers were employed.

Integrated steel producers also provide full pensions to certain workers when they are laid off before becoming eligible to retire. When large numbers are laid off, the cost of these provisions can be substantial. Such workers can receive full pensions with as little as 15 years of service if they are 55 or over, and those under 55 are eligible if the sum of their age and years of service is at least 80. Workers with 20 years of service who do not meet these criteria may also qualify for pension benefits. Laid-off employees who qualify for these special benefits are entitled to additional cash grants until they are 62, when they become eligible for Social Security. The steel firms also provide medical insurance for them.

Since employers' contributions to pension plans are largely based on previous experience, the pension funds' resources often will not entirely cover the obligations that are created when terminations exceed the historical rate. The amount of the deficiency is a liability on the firms' books. If a company is already in financial difficulty, the increase in liabilities can exceed its net worth and throw it into bankruptcy.

In the steel industry, such obligations to laid-off workers have affected operating decisions. A firm operates a plant so long as the revenues exceed the out-of-pocket costs, principally those for materials and labor. Pension plans in the steel industry, however, have turned part of the operating costs into a fixed cost--that is, laying off workers results in a substantial liability that is not affected by subsequent changes in output.

Since steel companies can avoid only part of workers' wages through layoffs, they tend to keep more capacity operating than would otherwise be justified. The pension arrangements also reduce their incentives to invest in labor-saving equipment. (Similarly, to the extent that a company has long-term contracts with materials suppliers requiring it to pay for inputs whether they are used or not, these inputs will also be considered fixed costs in making operating decisions.)

At present, when a company goes bankrupt the federal government's Pension Benefit Guaranty Corporation (PBGC) generally assures that workers covered by the plan receive their benefits. In return, the PBGC is entitled to certain assets of the bankrupt firm. A firm can thus be relieved of the liabilities of laying off workers by declaring bankruptcy and may then continue to operate under Chapter 11 of the Bankruptcy Code. This policy essentially subsidizes the least efficient firms, since they are the ones most likely to go bankrupt.

The government could aid the industry by agreeing to pay some of the costs associated with contraction without requiring firms to declare bankruptcy. Specifically, it could absorb some of the underfunding of pensions that arises in laying off workers. This assistance would make it easier for steel companies to cut back their operations and at the same time would enable them to devote more resources to modernization. Such a plan might be designed to assist all companies, whether or not they were on the brink of bankruptcy.

There are several arguments against this proposal. Lowering the cost of reducing capacity would undoubtedly help the industry, but would still leave it with high raw material costs and antiquated facilities. If the government underwrote expensive labor agreements in the steel industry, it could not refuse to do so for other industries as well. Finally, some firms have covenants in their loan agreements requiring them to maintain a given ratio of debts to assets; a firm might be forced into bankruptcy if closing a facility (reducing assets) deprived it of a source of financing.

CHAPTER V

THE EFFECTS OF ENVIRONMENTAL REGULATION

Federal and state programs designed to protect the environment impose a wide range of costs on all domestic industries. The iron and steel industry has been a major focus of these efforts, since it may be responsible for as much as 10 percent of all particulate air emissions and 15 percent to 20 percent of all conventional industrial water discharges. 1/ Not surprisingly, the industry's costs under environmental regulatory programs have been fairly substantial. Throughout the 1970s, expenditures on new plant and equipment for pollution control ranged from 10 percent to 20 percent of total capital spending in the industry. 2/ The impact of these expenditures on the industry's profitability has been a matter of continuing debate.

The conventional wisdom concerning the economic impact of environmental regulation on the iron and steel industry relies on several related propositions. First, the required capital expenditures displace other, more productive investments. Second, the operating and maintenance expenses associated with pollution control activities raise production costs, leaving producers at a competitive disadvantage against foreign producers of iron and steel, some of which are not subject to the same stringent requirements. While these effects seem obvious, most empirical research suggests that they are in fact relatively unimportant as compared with other difficulties facing the industry (such as those discussed elsewhere in this report).

For several reasons, it is difficult to isolate the impact of past and current environmental regulations on the economic status of the industry. The models used by analysts, as well as the available pollution control cost

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1. The air pollution estimates are drawn from air and water emission data bases as described in: U.S. Environmental Protection Agency, *NEDS National Emission Data System Information* (Research Triangle Park, N.C.: U.S. Environmental Protection Agency, November 1984); and Leonard P. Gianessi and Henry M. Peskin, *The RFF Environmental Data Inventory* (Washington, D.C.: Resources for the Future, April 1986).

2. McGraw-Hill Economics, *19th Annual McGraw-Hill Survey of Pollution Control Expenditures, 1985-1987* (New York: McGraw-Hill, May 1986).

data, do not provide a particularly reliable basis for estimating the economic effects of environmental cleanup. Further, most existing estimates of economic impacts were conducted in the late 1970s and early 1980s before the major industry downturns experienced in 1982-1984. None of these studies anticipated the substantial deterioration in the industry's economic condition. Nevertheless, they provide a basis for understanding the possible relationships between environmental regulation and the health of the industry.

POLLUTION CONTROL EXPENDITURES

Surveys and engineering studies of actual (or planned) expenditures on pollution abatement offer a crude but useful picture of the initial economic effects of environmental regulation on the industry. Table 7 presents vari-

TABLE 7. IRON AND STEEL INDUSTRY POLLUTION CONTROL COSTS, 1981 (In millions of 1981 dollars)

Source	Capital	Annual
Environmental Protection Agency [a]	329	1,600
Survey of Current Business [b]	610	
McGraw-Hill [c]	452	
Bureau of the Census [d]	459	1,221
American Iron and Steel Institute [e]	518	

a. U.S. Environmental Protection Agency, "The Cost of Clean Air and Water: Report to Congress 1984" (May 1984).

b. U.S. Department of Commerce, *Survey of Current Business* (June 1982).

c. McGraw-Hill Economics, *19th Annual McGraw-Hill Survey of Pollution Control Expenditures 1985-1987* (New York: McGraw-Hill, May 1986).

d. U.S. Department of Commerce, *Pollution Abatement Costs and Expenditures, 1981* (May 1982).

e. American Iron and Steel Institute, "Capital Expenditures by Iron and Steel Companies for Domestic Environmental Control and Solid Waste Disposal Facilities," AIS 17EC (Washington, D.C.).